CLAIMS

I/we claim:

1. An eccentric oscillating-type planetary gear device comprising:

an internally toothed gear, in which internal teeth having a plurality of rod-shaped pins on an inner periphery are provided by a constant pitch P;

an externally toothed gear, in which at least one crank shaft hole and a plurality of through holes are formed and which has external teeth meshed with the internal teeth on an outer periphery, the external teeth having a trochoid tooth profile and being less than the internal teeth by one;

a crank shaft that is inserted into the crank shaft hole and rotates to cause eccentric oscillation of the externally toothed gear; and

a support body that rotatably supports the crank shaft and has a plurality of pillar portions respectively loosely fitted into the through holes,

wherein a ratio obtained by dividing the diameter D of each of the pins constituting the internal teeth by the constant pitch P of the internal teeth is made smaller to an extent where tooth tops of the external teeth are radially outside the inner periphery of the internally toothed gear, and

portions of the external teeth that exceed at least the inner periphery of the internally toothed gear are cut, such that interference of the external teeth and the inner periphery of the internally toothed gear is prevented.

2. An eccentric oscillating-type planetary gear device comprising:

an internally toothed gear, in which internal teeth having a plurality of rod-shaped pins on an inner periphery are provided by a constant pitch P;

an externally toothed gear, in which at least one crank shaft hole and a plurality of through holes are formed and which has external teeth meshed with the internal teeth on an outer periphery, the external teeth having a trochoid tooth profile and being less than the internal teeth by one;

a crank shaft that is inserted into the crank shaft hole and rotates to cause eccentric oscillation of the externally toothed gear; and

a support body that rotatably supports the crank shaft and has a plurality of pillar portions respectively loosely fitted into the through holes,

wherein a ratio obtained by dividing a diameter D of each of the pins constituting the internal teeth by the constant pitch P of the internal teeth is made smaller to an extent where tooth tops of the external teeth are radially outside the inner periphery of the internally toothed gear, and

the inner periphery of the internally toothed gear between adjacent internal teeth is cut by a depth equal to or more than the amount of the external teeth exceeding the inner periphery, such that interference of the external teeth and the inner periphery of the internally toothed gear is prevented.

3. The eccentric oscillating-type planetary gear device according to claim 1, wherein, when a distance between a rotation direction front edge and a rotation direction rear edge after the external teeth are cut by a line M connecting inflection points of both tooth surfaces is F and a distance between a rotation direction front edge and a rotation direction rear edge of the external teeth after the external teeth are cut by a border N between a tooth tip portion and a tooth toe portion, by cutting the external teeth outside the line M and radially inside the border N the diameter D of each of the pins constituting the internal teeth is set equal to or more than a value obtained by subtracting the distance F from an inter-center linear distance Y of the pins constituting the internal teeth and equal to or less than a value obtained by subtracting the distance E from the inter-center linear distance Y.

4. The eccentric oscillating-type planetary gear device according to claim 1, wherein, when the radius of the pin circle V passing the centers of all the pins constituting the internal teeth is R and the number of the external teeth of the externally toothed gear Z, the diameter D of each of the pins constituting the internal teeth is in a range of $2R/Z \pm 1.5$ mm.

5. The eccentric oscillating-type planetary gear device according to claim 1, wherein, when the radius of the pin circle V passing the centers of all the pins constituting the internal teeth is R and a radial distance from the center O of the internally toothed gear to a meeting point C where action lines S of reaction force K of drive force components correspondingly given from the external teeth to the internal teeth meet is L, the radial distance L is in a range of 0.86 to 1.00 times the radius R.

6. An eccentric oscillating-type planetary gear device comprising:

an internally toothed gear, in which internal teeth having a plurality of rod-shaped pins on an inner periphery are provided;

an externally toothed gear, in which at least one crank shaft hole and a plurality of through holes are formed and which has a plurality of external teeth meshed with the internal teeth on an outer periphery, the external teeth having a trochoid tooth profile;

a crank shaft that is inserted into the crank shaft hole and rotates to cause eccentric oscillation of the externally toothed gear; and

a support body that rotatably supports the crank shaft and has a plurality of pillar portions respectively loosely fitted into the through holes,

wherein a meeting point C where actions lines S of reaction force K of drive force components correspondingly given from the external teeth to the internal teeth meet is positioned between a pin circle P passing the centers of all the pins constituting the internal teeth and an outer end passing circle G passing radially outer ends of all the through holes.

7. The eccentric oscillating-type planetary gear device according to claim 6, wherein the meeting point C is positioned between a tooth bottom circle M passing tooth bottoms of all the external teeth and the outer end passing circle G.

8. The eccentric oscillating-type planetary gear device according to claim 7, wherein the number of the external teeth is less than the number of the internal teeth by one.

9. An eccentric oscillating-type planetary gear device comprising:

an internally toothed gear, in which internal teeth having a plurality of rod-shaped pins on an inner periphery are provided;

an externally toothed gear, in which at least one crank shaft hole and a plurality of through holes are formed and which has external teeth meshed with the internal teeth on an outer periphery, the external teeth having a trochoid tooth profile and the number of the external teeth being less than the number the internal teeth by one;

a crank shaft that is inserted into the crank shaft hole and rotates to cause eccentric oscillation of the externally toothed gear; and

a support body that rotatably supports the crank shaft and has a plurality of pillar portions respectively loosely fitted into the through holes,

wherein, when an amount of eccentricity of the externally toothed gear to the internally toothed gear is H and the radius of each of the pins constituting the internal teeth is R, the amount of eccentricity H is in a range of 0.5 to 1.0 times the radius R, and

the external teeth are cut from the tooth tops by a predetermined amount, such that interference of the external teeth and the internal teeth of the internally toothed gear is prevented.

10. An eccentric oscillating-type planetary gear device comprising:

an internally toothed gear, in which internal teeth having a plurality of rod-shaped pins on an inner periphery are provided;

an externally toothed gear, in which at least one crank shaft hole and a plurality of through holes are formed and which has external teeth meshed with the internal teeth on an outer periphery, the external teeth having a trochoid tooth profile and the number of the external teeth being less than the number the internal teeth by one;

a crank shaft that is inserted into the crank shaft hole and rotates to cause eccentric oscillation of the externally toothed gear; and

a support body that rotatably supports the crank shaft and has a plurality of pillar portions respectively loosely fitted into the through holes,

when the amount of eccentricity of the externally toothed gear to the internally toothed gear is H and the radius of each of the pins constituting the internal teeth is R, the amount of eccentricity H is in a range of 0.5 to 1.0 times of the radius R, and

the inner periphery of the internally toothed gear between adjacent internal teeth is cut by a predetermined depth, such that interference of the external teeth and the internal teeth of the internally toothed gear is prevented.

11. The eccentric oscillating-type planetary gear device according to claim 9, wherein, when the radius of a pin circle P passing the centers of all the pins constituting the internal teeth is Q and a radial distance from the center O of the internally toothed gear to a meeting point C where action lines S of reaction force K correspondingly given from the external teeth to the internal teeth meet is L, the radial distance L is in a range of 0.86 to 1.00 times the radius Q.

12. The eccentric oscillating-type planetary gear device according to claim 9, wherein, a distance between a rotation direction front edge and a rotation direction rear edge at any one external tooth after cutting is E and a distance between a rotation direction front edge and a rotation direction rear edge at two adjacent external teeth is F, the distance E is set larger than the distance F.